



**UNITED STATES DEPARTMENT OF COMMERCE**  
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/387,477	09/01/99	TOMITA	M TIJ-26105

023494 MMC2/1025  
TEXAS INSTRUMENTS INCORPORATED  
P O BOX 655474, M/S 3999  
DALLAS TX 75265

EXAMINER	
GUERRERO, M	
ART UNIT	PAPER NUMBER

2822

DATE MAILED: 10/25/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	09/387,477	TOMITA ET AL.	
	Examiner	Art Unit	
	Maria Guerrero	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10 August 2001.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All   b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other:  |

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### DETAILED ACTION

1. This Office Action is in response to the Request for a CPA and the Amendment filed August 10, 2001.

Claims 8-9 are canceled.

Claims 1-7 are pending.

### *Continued Prosecution Application*

2. The request filed on August 10, 2001 for a Continued Prosecution Application (CPA) under 37 CFR 1.53(d) based on parent Application No. 09/387,477 is acceptable and a CPA has been established. An action on the CPA follows.

### *Claim Objections*

3. Claim 1 is objected to because of the following informalities: claim 1 recites the limitations "**multiple types** of fluorocarbon gases", (hereafter called C/F ratio).

Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. Claims 1-4 are rejected under 35 U.S.C. 102(b) as being anticipated by Arleo et al. (U.S. 5,176,790).

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Arleo et al. teaches providing a semiconductor substrate having an insulating layer, etching the insulating layer using a mixed of fluorocarbon gases that have different ratios of carbon atoms to fluorine atoms (fig. 1-3, col. 1, lines 20-30, col. 3, lines 20-25, 40-50, col. 4, lines 38-55). Arleo et al. discloses the mixed of fluorocarbon gases comprises a first amount of first fluorocarbon gas with a large C/F ratio, mixed with a second amount of a second fluorocarbon gas with a small C/F ratio, the amount of the second fluorocarbon gas being less than the amount of the first fluorocarbon gas (col. 3, 20-52, col. 4, lines 40-50, col. 6, lines 1-5). In addition, Arleo et al. teaches using  $C_4F_8$  as first fluorocarbon gas and at least one of  $CHF_3$ ,  $CF_4$  as a second fluorocarbon gas (col. 3, lines 20-25, 40-52, col. 8, lines 9-17, col. 11, lines 34-45). Arleo et al. discloses the insulating layer being plasma etched, the semiconductor substrate having a lower conducting layer (fig. 1-2, col. 3, lines 5-20, col. 11, lines 5-10).

5. Claims 1-3 are rejected under 35 U.S.C. 102(e) as being anticipated by Liu et al. (U.S. 5,906,948).

Liu et al. teaches providing a semiconductor substrate having an insulating layer, etching the insulating layer using a mixed of fluorocarbon gases that have different ratios of carbon atoms to fluorine atoms (Abstract). Liu et al. discloses the mixed of fluorocarbon gases comprises a first amount of first fluorocarbon gas with a large C/F ratio, mixed with a second amount of a second fluorocarbon gas with a small C/F ratio, the amount of the second fluorocarbon gas being less than the amount of the first fluorocarbon gas (col. 3, lines 20-30). Liu et al. teaches using  $C_4F_8$  as first fluorocarbon gas and  $CHF_3$  as a second fluorocarbon gas (Abstract, col. 3, lines 20-30).

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6. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Tang et al. (U.S. 6,211,092).

Tang et al. teaches providing a semiconductor substrate having an insulating layer, etching the insulating layer using a mixed of fluorocarbon gases that have different ratios of carbon atoms to fluorine atoms (Abstract).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 2-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tang et al. (U.S. 6,211,092) in view of Miyazaki et al. (U.S. 5,804,878).

Regarding claims 2-7, Tang et al. teaches a plasma-etching process using fluorocarbon gases such as,  $C_4F_8$ ,  $CHF_3$ , and  $CH_2F_2$  (Abstract, col. 6, lines 5-15). Tang et al. discloses using silicon oxide using TEOS and spin-on glass layers (col. 2, lines 10-12, col. 14, lines 40-50). Tang et al. teaches as conventional in the art, advanced integrated circuits contain multiple wiring layers separated from the silicon substrate and from each other by dielectric layers; several layers of metallization with intervening inter-level dielectric layers are required; and contact or via holes are filled with a conductor typically aluminum col. 1, lines 35-55).

Tang et al. fails to show the lower conducting layer having a titanium nitride layer, a layer of aluminum, a titanium layer and a titanium nitride layer stacked in that order.

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However, Miyazaki et al. shows the use of these materials as conventional in the art (Abstract, fig. 1 (D), col. 2, lines 1-12, 30-40, col. 4, lines 45-60).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to include Miyazaki et al.'s teachings in Tang et al.'s process. The modification would provide a process that can be applied to a dual damascene structure and to other multi-layer dielectric structures.

In addition, the amount of etching gas is considered to be obvious, since these are variables of art recognized importance which are subject to routine experimentation and optimization and discovery of an optimum value for a known process is obvious. In *Re Aller*, 105 USPQ 233 (CCPA 1955).

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Keswick et al. (U.S. 5,399,237), Rutherford "A New Low Dielectric Constant Planarization Dielectric", JP 561222129, and Wang et al. (U.S. 6,297,167) disclose a plasma process comprising fluorocarbon gases.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 703-305-0162.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on 703-308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are 703-

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308-7722 for regular communications and 703-308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

MG  
MG

October 22, 2001

  
CARL WHITEHEAD, JR.  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800